

Claims

- [c1] 1. A method of forming a wireless data communication network among transceivers, each transceiver including a designation with a first plurality of transceivers having a first common designation and a second plurality of transceivers having a second common designation different from the first common designation, the method comprising the steps of:
- (a) forming an ad hoc hierarchical network for each of the first plurality and second plurality of transceivers; and
 - (b) communicating to an external network from each transceiver of each ad hoc hierarchical network by,
 - (i) establishing a communication link between each transceiver in a level of the ad hoc hierarchical network, other than the highest level, with a transceiver in the next higher level of the ad hoc hierarchical network such that transceivers pass communications upward in the ad hoc hierarchical network; and
 - (ii) establishing a communication link between a transceiver in the highest level of the ad hoc hierarchical network and an external network access transceiver, such that communications from transceivers in the ad hoc hierarchical network are passed through the transceiver in the highest level

of the ad hoc hierarchical network to the external network access transceiver.

[c2] 2. A method of forming a wireless data communication network among transceivers in an asset-tracking system, each transceiver including a class designation with a first plurality of transceivers having a first class designation and a second plurality of transceivers having a second class designation different from the first class designation, the method comprising the steps of:

(a) forming an ad hoc hierarchical class based network for each of the first plurality and second plurality of transceivers; and

(b) communicating to an external network from each transceiver of each ad hoc hierarchical class based network by,

(i) establishing a communication link between each transceiver in a level of the ad hoc hierarchical class based network, other than the highest level, with a transceiver in the next higher level of the ad hoc hierarchical class based network such that transceivers pass communications upward in the ad hoc hierarchical class based network; and

(ii) establishing a communication link between a transceiver in the highest level of the ad hoc

hierarchical class based network and an external network access transceiver, such that communications from transceivers in the ad hoc hierarchical class based network are passed through the transceiver in the highest level of the ad hoc hierarchical class based network to the external network access transceiver.

- [c3] 3. The method of claim 2, wherein said step of forming an ad hoc hierarchical class based network for each of the first plurality and second plurality of transceivers comprises the steps of:
- (a) filtering, by each transceiver, transmissions from other transceivers for an identification of its class designation within the transmission;
 - (b) transmitting, from a primary transceiver of the first plurality, a primary availability signal including an identification of the first class designation and an identification of the primary transceiver transmitting the primary availability signal;
 - (c) transmitting, from a primary transceiver of the second plurality, a primary availability signal including an identification of the second class designation and an identification of the primary transceiver of the second plurality transmitting the primary availability signal;

(d) transmitting, from a transceiver receiving a primary availability signal having an identification therein of its class designation, a registration signal including an identification of the class designation and an identification of the transceiver transmitting the registration signal;

(e) identifying a transceiver transmitting a registration signal as a secondary transceiver by a primary transceiver of the same class designation, the primary transceiver thereby assuming a higher level in the ad hoc hierarchical class based network relative to the said identified secondary transceiver such that communication from the secondary transceiver to the external network is passed to the primary transceiver.

[c4] 4. The method of claim 3, further comprising the step of identifying a transceiver transmitting a registration signal as a newly promoted primary transceiver by a primary transceiver of the same class designation when the communication channel capacity of the primary transceiver is reached, the primary transceiver thereby assuming a lower level in the ad hoc hierarchical class based network relative to the said identified newly promoted primary transceiver such that communication from the primary transceiver to the external network is passed to the newly promoted primary transceiver and such that communication to the external network from any

secondary receivers of the primary transceiver is passed through the primary transceiver to the newly promoted primary transceiver.

[c5] 5. The method of claim 4, wherein said step of forming an ad hoc hierarchical class based network comprises forming a ad hoc hierarchical class based network in a bottom-up manner.

[c6] 6. The method of claim 3, further comprising the step of identifying, by a primary transceiver when the communication channel capacity of the primary transceiver is reached, a secondary transceiver thereof as a new primary transceiver of the next lower level of the ad hoc hierarchical class based network, the new primary transceiver then transmitting a primary availability signal including an identification of its class designation and an identification of itself for identifying secondary receivers relative thereto, whereby communication to the external network from any secondary transceivers relative to the new primary transceiver is passed to new primary transceiver and then passed to the primary transceiver in the next higher level of the ad hoc hierarchical class based network.

[c7] 7. The method of claim 6, wherein said step of forming an ad hoc hierarchical class based network comprises forming a ad hoc hierarchical class based network in a top-down manner.

- [c8] 8. The method of claim 2, wherein the primary transceivers of the highest levels of the ad hoc hierarchical class based networks are located within a broadcast area of the external network access transceiver.
- [c9] 9. The method of claim 8, wherein other transceivers of the ad hoc hierarchical class based networks are not located within a broadcast area of the external network access transceiver.
- [c10] 10. The method of claim 2, wherein a communication from the external network is broadcast by the external network access transceiver to all transceivers within the broadcast area of the external network access transceiver.
- [c11] 11. The method of claim 10, wherein the communication includes an identification of a class designation and only those transceivers having a matching class designation receive and process the communication from the external network access transceiver.
- [c12] 12. The method of claim 2, wherein a communication from the external network is broadcast by the external network access transceiver to a transceiver in the highest level of each ad hoc hierarchical class based network and not to all transceivers within the broadcast area of the external network access transceiver.
- [c13] 13. The method of claim 12 wherein each transceiver in the

highest level of each ad hoc hierarchical class based network retransmits the communication from the external network access transceiver to other transceivers in its ad hoc hierarchical class based network.

[c14] 14. The method of claim 12 wherein the external network access transceiver transmits the communication at a reduced power level.

[c15] 15. The method of claim 12 wherein the external network access transceiver transmits the broadcast at a reduced power level.

[c16] 16. The method of claim 12 wherein the transceivers in the highest level of the ad hoc hierarchical class based networks represent the physically closest transceiver to the external network access transceiver for its respective class designation.

[c17] 17. The method of claim 12, wherein the communication includes an identification of transceivers in the highest level of the ad hoc hierarchical class based networks.

[c18] 18. The method of claim 2, wherein the transceivers are used to track assets.

[c19] 19. The method of claim 18, wherein the transceivers of the first and second pluralities are used to communicate with the

transceivers attached to the tracked assets.

[c20] 20. The method of claim 19, wherein the transceivers attached to the tracked assets comprise transponders.

[c21] 21. The method of claim 19, wherein the transceivers attached to the tracked assets are semi-passive and the each of the first plurality and second plurality of transceivers are active.

[c22] 22. The method of claim 19, further comprising the step of assigning a class designation to each plurality of transceivers based on a common characteristic or behavior of the assets associated with the transponders when read by each of the plurality of transceivers.

[c23] 23. An ad hoc class based network formed in accordance with the step of the method of claim 2.

[c24] 24. The wireless data communication network formed by the method of claim 2.

[c25] 25. The wireless data communication network of claim 24, wherein said wireless data communication network comprises a distributed hierarchical database for tracking assets.

[c26] 26. Computer readable-medium having computer-executable instructions for performing the ad hoc class based network formation steps recited in claim 3.

[c27] 27. A transceiver including the computer-readable medium

recited in claim 26.

- [c28] 28. A method for communicating to a recipient transceiver from a plurality of transceivers, the plurality of transceivers being located within the broadcast range of the recipient transceiver, the method comprising the steps of:
- (a) transmitting a communication at a first power level such that only a first group of transceivers receive the broadcast, the communication including a command causing each of the first group of transceivers not to respond to a subsequent broadcast; and subsequent thereto
 - (b) transmitting a communication at a second power level greater than the first power level such that a second group of transceivers greater than and including the first group of transceivers receive the broadcast, but such that only a limited number of transceivers of the second group respond to the broadcast, the limited number of transceivers excluding the first group of transceivers.
- [c29] 29. A method for communicating to a recipient transceiver from a plurality of transceivers, the plurality of transceivers being located within the broadcast range of the recipient transceiver and the plurality of transceivers exceeding the number of transceivers from which communications can be received by the transceiver without radio frequency

interference due to its channel capacity, the method comprising the steps of:

(a) transmitting a communication at a first power level such that only a first group of transceivers receive the broadcast, the first group in number of transceivers being not greater than the number of transceivers from which communications can be received by the transceiver without radio frequency interference due to its channel capacity, the communication including a command causing each of the first group of transceivers not to respond to a subsequent broadcast; and subsequent thereto

(b) transmitting a communication at a second power level greater than the first power level such that a second group of transceivers greater than and including the first group of transceivers receive the broadcast, but such that only a limited number of transceivers of the second group respond to the broadcast, the limited number of transceivers excluding the first group of transceivers and comprising not greater the number of transceivers from which communications can be received by the transceiver without radio frequency interference due to its channel capacity.

[c30] 30. The method of claim 29, wherein the recipient transceiver

comprises an external network access transceiver.

- [c31] 31. The method of claim 29, wherein each of the plurality of transceivers comprises a transceiver attached to an asset to be tracked.
- [c32] 32. The method of claim 31, wherein the transceivers attached to the tracked assets comprise transponders.
- [c33] 33. The method of claim 31, wherein the transceivers attached to the tracked assets are semi-passive and the recipient transceiver is active.
- [c34] 34. The method of claim 29, wherein each of a first set of transceivers of the plurality of transceivers includes a first class designation and each of a second set of transceivers of the plurality of transceivers includes a second class designation different from the first class designation, and wherein each communication includes an identification of one of the class designations.
- [c35] 35. The method of claim 34, further comprising the step of assigning a class designation to each of the plurality of transceivers.
- [c36] 36. The method of claim 34, further comprising the step of filtering, by each transceiver of the plurality, communications from the recipient transceiver for an identification of its class

designation within the communication.

[c37] 37. The method of claim 36, further comprising ignoring, by each transceiver of the plurality, each communication if an identification of its class designation is not found therein.

[c38] 38. The method of claim 34, wherein each of the plurality of transceivers comprises a transceiver attached to an asset to be tracked.

[c39] 39. The method of claim 38, wherein each class designation of the transceivers represents a common characteristic or behavior of the asset tracked thereby.